REMARKS

Reconsideration of the above-identified patent application, as amended herein, is respectfully requested.

This Amendment is in response to the Office Action dated April 20, 2000. Claims 1-7 have been rejected. Claims 1-7 are canceled herein and replaced with new claims 8-14. Of the foregoing, only claims 8 and 9 are independent.

A Substitute Translation of the International Application, including the Amendments of April 16, 1999 made during the International Phase, is enclosed herewith. It appears that a page from the Verified Translation filed on July 28, 1999, may have been inadvertently excluded. It appears that the translation of page 7 of the German language application was inadvertently excluded. No new matter has been added because the German language application entered the National Phase on July 28, 1999, with this page included. The Amendments made herein to the specification, and the references to certain locations in the specification, refer to the page/line numbering of the Substitute Translation.

Although the disclosure has not been objected to by the Examiner, the specification is amended to correct typographical errors, and to provide headings in accordance with accepted

practice. An Abstract is also submitted to conform with the requirements set forth in 37 CFR 1.72 and MPEP 608.01(b). No new matter has been added.

Claims 5-7 have been rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. Claims 6 and 7 have also been rejected under 35 U.S.C. §112, second paragraph, for not particularly pointing out and distinctly claiming the subject matter of the invention. Claims 5 -7 are canceled herein and replaced with new claims 12-14. The new claims were drafted with consideration of the various informalities noted in the Office Action, and which are now believed to overcome the rejections under 35 U.S.C. §112, second paragraph, and the rejection under 35 U.S.C. §101. Accordingly, it is requested that these rejections be withdrawn.

Claims 1 and 3-7 have been rejected under 35 U.S.C.§103(a) as being unpatentable over Kondo et al. (US Patent 4,110,110), and claims 1-7 have been rejected as being unpatentable over German Patent 1,233,609. Claims 1-7 are canceled herein and replaced with new claims 8-14 which are directed generally to the subject matter previously presented in the canceled claims, and rewritten in clean claim form for the Examiner's convenience. For a rejection under 35 U.S.C. §103(a) to be sustained, the differences between the features of the references and the present invention must be obvious to one skilled in the art.

New claim 8 recites:

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"8. Austenitic nickel-chromium-molybdenum alloys with additions of silicon, ***consisting essentially of*** (in mass percentages):

Chromium:	18 to 22%
Molybdenum:	6 to 10%
Silicon:	***0.6 to 1.7%***
Carbon:	0.002 to 0.05%
Iron:	1 to 5%
Manganese:	0.05 to 0.5%
Aluminum:	0.1 to 0.5%
Titanium:	0.1 to 0.5%
Magnesium:	0.005 to 0.05%
Calcium:	0.001 to 0.01%
Vanadium:	max. 0.5%
Phosphorus:	max. 0.02%
Sulphur:	max. 0.01%
Boron:	0.001 to 0.01%
Copper:	max. 0.5%
Cobalt:	max. 1%
Niobium:	max. 0.5%
Hafnium:	***0.02 to 0.5%***

balance nickel and residual impurities wherein the total amount of Nb +Al + Ti does not exceed 1%."

Kondo et al. disclose a nickel-based alloy containing similar components but do not disclose the presence of 0.6 to 1.7 % silicon. In contrast, Kondo et al. disclose a silicon content of 0.05 to 0.5%, which is preferably within the range of 0.05 to 0.2%. See column 3, line 17, and column 4, line 28. Although Kondo et al. do disclose the presence of silicon in their alloy, Kondo et al. limit the amount of silicon to the above-noted amounts to prevent spalling of the oxide film and to inhibit the occurrence of selective oxidation of grain boundaries. See column 4, lines 56-59.

Specifically, Kondo et al. teach a minimum of 0.05% and a **maximum of 0.5%** silicon. Kondo et al. expressly teach that a silicon content over the maximum of 0.5% causes the undesirable effect of the occurrence of "whisker crystals" in the alloy. See column 2, lines 52-64. Kondo et al. teach that an alloy which is easily susceptible to these whisker crystal is substantially wearable by high-temperature oxidation, and often causes contamination of surrounding parts. See column 5, lines 5-10, especially lines 9-10 which recite:

"Silicon content should not therefore be over 0.5%, preferably not over 0.2%."

Column 11, lines 46-51 of Kondo et al. recite:

> "...when the silicon content exceeds 0.1%, growth of whisker crystals becomes apparent, and this trend becomes more remarkable as the silicon content increases. In view of the foregoing, when the other characteristics are ignored, the **least possible silicon content** is desirable."

The silicon content taught in Kondo et al. is in stark contrast to the present invention which discloses an alloy which has 0.6 to 1.7% silicon. This is **well above** the range taught by Kondo et al. The present invention requires, in accordance with new claim 8, a **minimum** of 0.6% silicon to produce the desired results of high corrosion resistance to chloride and sulfate corrosion. See the specification, page 6, the entire page.

It would therefore not have been obvious to one of ordinary skill in the art to include silicon in the range of 0.6 to 1.7% by reading Kondo et al., as Kondo et al. teach away from a silicon content greater than 0.5%.

Kondo et al., not being limited to the preferred embodiments, but rather being considered as a whole, **do not** teach a silicon content greater than 0.5%, as required by claim 8 of the present invention. Therefore, Kondo et al. do not render the present invention obvious.

Furthermore, the present invention requires, according to new claim 8, the presence of 0.02 to 0.5% hafnium. Hafnium is included in the alloy of the present invention to improve adherence of protective oxide layers in case of rapid temperature changes, specifically in automobile exhaust systems. See the specification, page 7, lines 10-13.

Nowhere do Kondo et al. disclose or teach an alloy having 0.02 to 0.5% hafnium. In contrast, Kondo et al. are silent in this regard. The alloy of Kondo et al. "consists essentially of" the components listed in column 3, lines 7-26. Components having any essential significance to the combination, other than those listed, are therefore **excluded** from the combination. As hafnium has an essential significance to the alloy of the present invention, it would not have been obvious for one skilled in the art, by reading Kondo et al., to include 0.02 to 0.5% hafnium in the alloy.

Furthermore, new claim 8 **consists essentially of** the elements recited therein. As noted above, the term "consisting essentially of" excludes components having any essential significance from the combination. Therefore, new claim 8 excludes the presence of tungsten in the alloy. In contrast, Kondo et al. **require** 0.1 to 25% tungsten. Tungsten has significance in the alloy and is included to "intensify the solid-solution with a view to improving the mechanical properties and the workability of Ni-Cr alloys...." See column 1, lines 63-65.

In contrast, tungsten is excluded from the alloy according to the present invention because it is known by one skilled in the art to have negative effects on the claimed alloy. Tungsten is known to initiate precipitation of intermetallic phases, and lead to brittleness, or loss of ductility. The amounts of aluminum, titanium, and niobium are limited to 1% in the invention for the same reason. See the specification, page 8, lines 1-3. Furthermore, it is known that tungsten included in the inventive alloy will have a negative effect on the corrosion resistance of the alloy. For these reasons, the element tungsten is **excluded** from the invention, as claimed in claim 8, by use of the language "consisting essentially of."

German Patent 1,233,609 ('609) discloses a nickel chromium alloy consisting of similar components. However, the invention, as recited in claim 8, contains the elements recited in much more restricted quantities than those disclosed in '609. Specifically, the present invention limits the range of chromium to 18 to 22%, wherein '609 teaches a very wide range of 5 to 30%. See

the specification, page 7, lines 5-7 which recite: "The chromium content of the alloy according to the invention should be between 18% and 22% in order to ensure sufficient corrosion resistance. Greater contents in chromium render the workability of nickel-chromium-molybdenum alloys markedly more difficult." Therefore, the claimed invention **cannot** contain over 22% chromium, as allowed by '609.

Furthermore, the present invention limits the range of molybdenum to 6 to 10%, wherein '609 teaches a very wide range of 0 to 15%. Molybdenum is a very important component of the present invention, in the amounts recited, to obtain the desired characteristics of the inventive alloy. See the specification, page 7, lines 1-4, which state that the **minimum** amount of molybdenum of 6% is **required** "in order to avoid wet corrosion in case of a drop below the dew point." The maximum amount of molybdenum is also very specific, and is limited to 10%. This is "because, as shown in Fig. 4, the vulnerability to sulphate corrosion increases with molybdenum contents." See the specification, page 7, lines 1-4.

In contrast, '609 teaches the very broad range molybdenum content of 0 to 15%. Although the range of molybdenum disclosed in '609 overlaps the molybdenum content disclosed in the present invention, '609 may **exclude** the presence of molybdenum in the alloy. A content of 0% is taught by this reference. This is in contrast to the present invention which discloses a molybdenum content of **at least 6%** to obtain the desired characteristics of the inventive alloy.

Still further, the present invention limits the range of iron, in accordance with claim 8, to 1 to 5%, wherein '609 teaches a wider range of 0 to 5%. Iron is a very important component of the present invention, in the amounts recited, to obtain the desired characteristics of the alloy. See the specification, page 7, lines 15-18, which state that the **minimum** amount of iron **required** by the invention is 1% "to ensure the workability of the alloy." A maximum of 5% of iron is disclosed "as the danger that slightly volatile iron chlorides many be produced exists in case of higher iron contents in chloride-containing media." (Page 7, lines 15-18.)

In contrast, '609 teaches the range of iron may be from 0 to 5%. Although the range of iron disclosed in '609 overlaps the iron content disclosed in the present invention, '609 may **exclude** the presence of iron in the alloy. A content of 0% is taught by this reference. This is in contrast to the present invention which discloses an iron content of **at least 1%** to obtain the desired characteristics of the inventive alloy.

According to the specification, at page 6:

> "The outstanding characteristics of the alloy according to the invention can be attributed to the silicon additions and to the coordination of the alloy elements molybdenum, chromium and iron."

The inventive alloy therefore discloses specific minimum and maximum ranges of silicon, molybdenum, chromium, and iron. The alloy taught by '609 may only contain chromium; molybdenum, silicon, and iron may be **excluded** from the combination.

Accordingly, it is respectfully submitted that new claim 8 is not rendered obvious by either Kondo et al. or German Patent No. 1,233,609. As new claims 10-14 depend from new claim 8, it is believed that they too are not rendered obvious by either Kondo et al. or '609. It is respectfully submitted that the rejection under 35 U.S.C. §103(a) thereto be withdrawn.

New claim 9 corresponds to canceled claim 2, which has been rejected as being obvious over DE 1,233,609. New claim 9 relates to a preferred embodiment of the invention and contains similar components to the alloy of claim 8, but are somewhat restricted. Specifically, claim 9 restricts the contents of chromium, molybdenum, silicon, and iron, even further than claim 8, as follows:

	Claim 8	Claim 9
Chromium	18 to 22%	18 to 20%
Molybdenum	6 to 10%	8 to 9%
Silicon	0.6 to 1.7%	0.7 to 1.1%
Iron	1 to 5%	2.5 to 3.5%

Furthermore, the alloy of claim 9 also contains a more restricted amount of hafnium (0.03 to 0.06%) than the range disclosed in claim 8. For the reasons discussed above with regard to claim 8, it is also believed that claim 9 is not rendered obvious by DE 1,233,609. Specifically, the present invention requires specific limited contents of chromium, silicon, molybdenum, and iron to achieve the desired characteristics of the alloy. These ranges are much more specific than those taught by '609, as noted above.

Accordingly, it is respectfully submitted that new claim 9 is not rendered obvious by DE 1,233,609. It is respectfully submitted that the rejection under 35 U.S.C. §103(a) thereto be withdrawn.

In light of the foregoing amendments and arguments, the application is now believed to be in proper form for allowance of all claims and a notice to that effect is earnestly solicited.

Respectfully submitted,
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